



UNITED STATES PATENT AND TRADEMARK OFFICE

52
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/022,665

12/18/2001

Kameran Azadet

15-7

1787

7590

05/12/2005

Ryan, Mason & Lewis, LLP
1300 Post Road, Suite 205
Fairfield, CT 06430

EXAMINER

TORRES, JOSEPH D

ART UNIT

PAPER NUMBER

2133

DATE MAILED: 05/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/022,665

Applicant(s)

AZADET ET AL.

Examiner

Joseph D. Torres

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,9-14 and 19-25 is/are pending in the application.
- 4a) Of the above claim(s) 11-14, 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4,9,10 and 21-25 is/are rejected.
- 7) ☒ Claim(s) 23-25 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I (claims 1-10 and 21) in the reply filed on 04/11/2005 is acknowledged. The traversal is on the ground(s) that "the restriction requirement is improper and should be withdrawn, since each Group is generally related to decoding multidimensional codes, and it is believed that a complete search for each Group would require a search of most, if not all, of the individual classes and subclasses. Accordingly, Applicants submit that an examination of both Groups would not impose a serious burden on the Examiner. Where, as here, 'the search and examination of an entire application can be made without serious burden, the Examiner must examine it on the merits, even though it includes claims to distinct or independent inventions. ' MPEP §803". This is not found persuasive because a search for Group I should include the following word search and class search, "(((Multidimensional product Multi-dimensional dimensional dimension Multi-dimension concatenated modulation) adj2 (code codes coding coded coder encode codes encoding encoded encoder)) and ((fading interference) with (compensate compensating compensates compensated compensation))) 714/755.ccls." comprising 1218 patents and application publications whereas a search for Group II should include the following word search and class search, "(((Multidimensional product Multi-dimensional dimensional dimension Multi-dimension concatenated modulation) adj2 (code codes coding coded coder encode codes encoding encoded encoder)) and (branch adj metric)) 714/794-796.ccls."

Art Unit: 2133

comprising 2186 patents and application publications, 2065 which are not found in the search for Group I. The Examiner has not even mentioned what a required non-patent literature search would entail. The Examiner asserts that searching the two inventions would create an undue burden for the Examiner.

The requirement is still deemed proper and is therefore made FINAL.

Claims 11-14, 19 and 20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 04/11/2005.

This application contains claims 11-14, 19 and 20 drawn to an invention nonelected with traverse. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Drawings

2. The Applicant contends, "Please amend FIG. 6, as indicated on the attached marked-up copy of original FIG. 6. No new matter is introduced".

The Examiner asserts that no such Figure was included with the amendment filed on 04/11/2005.

Specification

3. In view of the amendment filed on 04/11/2005, the Examiner withdraws all objections to the specification.

Claim Objections

4. Claims 23-25 make no sense since they depend from cancelled claims.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 2 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Nowhere does the Applicant teach the new matter, "the symbol components of one multidimensional code symbol are transmitted over more than one symbol interval associated with one of said symbol components", recited in claim 2. Page 4, lines 16-19 of the Applicants disclosure instead teaches that multidimensional codes are transmitted over multiple one-dimensional symbol durations. The Examiner assumes the Applicant intended: --multidimensional codes are transmitted over multiple one-dimensional symbol durations--.

Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not

Art Unit: 2133

described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Nowhere does the Applicant teach the new matter, "multidimensional code symbol comprises a number of transmitted symbol components that exceeds a number of available channels", recited in claim 3. Page 4, lines 16-19 of the Applicants disclosure instead teaches that multidimensional codes are transmitted over multiple one-dimensional symbol durations. The Examiner assumes the Applicant intended: --multidimensional codes are transmitted over multiple one-dimensional symbol durations--.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 22-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "corresponding state" in claim 22 is a relative term which renders the claim indefinite. The term "corresponding state" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Note: the term "state" is not used anywhere else in claim 1 and 22; hence it is impossible to determine the relationship between symbols and corresponding states (Note: symbols are data values not states).

Claims 23-25 make no sense since they depend from cancelled claims.

Claims 22-26 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 22 recites, "calculating an error metric for an initial symbol component using survivor symbols from a corresponding state to account for intersymbol interference". The omitted structural cooperative relationships are: the relationship between "error metric", "initial symbol component", "survivor symbols", "corresponding state" and any of the steps in claim 1.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Amca et al. (Amca, H.; Yenil, T.; Hacioglu, K.; Adaptive equalisation of frequency selective multipath fading channels based on sample selection, IEE Proceedings Communications, Volume 146, Issue 1, Feb. 1999, Pages: 55 – 60; hereafter referred to as Amca).

Art Unit: 2133

35 U.S.C. 102(b) rejection of claims 1 and 21.

Amca teaches compensating for inter-symbol interference, referred to as ISI, caused by previously decoded multidimensional code symbols (Section 3.2 in col. 2 on page 57 of Amca teaches conventional DFEs are used to compensate for ISI using previously decoded symbols that are feedback; Note: the symbols are CQPSK modulation encoded and CQPSK is a multi-dimensional modulation code; Note also that the DFE in Figure 6 of Amca is a decoder for determining the symbol value d_k of received multi-dimensional CQPSK modulation codeword r_k); and compensating for intra-symbol interference, referred to as ISI, caused by symbol components within the same multidimensional code symbol (The sentence above to Figure 3 on page 57 and the Abstract of Amca teach that N different conventional DFEs are employed to compensate for ISI by taking samples of a current symbol to drive the N different conventional DFEs and selecting the best DFE to be used).

35 U.S.C. 102(b) rejection of claims 2 and 3.

By design the CQPSK multidimensional modulation code in Amca is transmitted over multiple one-dimensional symbol durations (Note: a CQPSK multidimensional modulation code requires two channels often referred to the I and Q channels each channel representing a single dimension of the CQPSK multidimensional modulation code).

35 U.S.C. 102(b) rejection of claim 22.

Feedback Transversal Filter in Figure 6 on page 57 of Amca is used for calculating an error metric to be added to an initial symbol component received from Feedforward Transversal Filter in Figure 6 using survivor symbols d_k from a corresponding state to account for intersymbol interference.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amca et al. (Amca, H.; Yenil, T.; Hacioglu, K.; Adaptive equalisation of frequency selective multipath fading channels based on sample selection, IEE Proceedings Communications, Volume 146, Issue 1, Feb. 1999, Pages: 55 – 60; hereafter referred to as Amca) in view of Bottomley; Gregory E. (US 5680419 A).

Art Unit: 2133

35 U.S.C. 103(a) rejection of claim 4.

Amca substantially teaches the claimed invention described in claims 1-3 (as rejected above). In addition, Amca teaches calculating inter-symbol interference estimates based on said previously decoded multidimensional code symbols (Section 3.2 in col. 2 on page 57 of Amca teaches conventional DFEs are used to compensate for ISI using previously decoded symbols that are feedback; Note: the symbols are CQPSK modulation encoded and CQPSK is a multi-dimensional modulation code; Note also that the DFE in Figure 6 of Amca is a decoder for determining the symbol value d_k of received multi-dimensional CQPSK modulation codeword r_k); calculating intra-symbol interference estimates based on possible data symbol values (The sentence above to Figure 3 on page 57 and the Absatract of Amca teach that N different conventional DFEs are employed to compensate for laSI by taking samples of a current symbol to drive the N different conventional DFEs and selecting the best DFE to be used). However Amca does not explicitly teach the specific use of calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates.

Bottomley, in an analogous art, teaches use of calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates (Branch Metric Processor 203 in Figure 2 of Bottomley is a means for calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Amca with the teachings of Bottomley by including use of calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates would have provided the ability to use a maximum likelihood decoding method for a channel with memory.

8. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amca et al. (Amca, H.; Yenai, T.; Hacioglu, K.; Adaptive equalisation of frequency selective multipath fading channels based on sample selection, IEE Proceedings Communications, Volume 146, Issue 1, Feb. 1999, Pages: 55 – 60; hereafter referred to as Amca) and Bottomley; Gregory E. (US 5680419 A) in view of Ghosh; Monisha et al. (US 6734920 B2).

35 U.S.C. 103(a) rejection of claim 9.

Amca and Bottomley substantially teaches the claimed invention described in claims 1-8 (as rejected above).

However Amca and Bottomley do not explicitly teach the specific use of determining a best surviving path.

Art Unit: 2133

Ghosh, in an analogous art, teaches use of determining a best surviving path (Figure 12 in Ghosh is an algorithm for determining a best surviving path). Note: Amca and Bottomley teach branch metrics for use in a maximum likelihood decoding algorithm but do not teach the details of the maximum likelihood decoding algorithm whereas Ghosh teaches the maximum likelihood decoding algorithm required in the Amca and Bottomley patents.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Amca and Bottomley with the teachings of Ghosh by including use of the maximum likelihood decoding algorithm taught in the Ghosh patent. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of the maximum likelihood decoding algorithm taught in the Ghosh patent would have provided the opportunity to implement the maximum likelihood decoding algorithm required by the Amca and Bottomley patents.

35 U.S.C. 103(a) rejection of claim 10.

Amca and Bottomley substantially teaches the claimed invention described in claims 1-8 (as rejected above).

However Amca and Bottomley do not explicitly teach the specific use of a 4D-TCM code.

Ghosh, in an analogous art, teaches an n dimensional TCM code (see Figure 3). Note: The decoder in Bottomley is a multidimensional decoder and an n dimensional TCM

Art Unit: 2133

code is a multidimensional code, hence the decoder in Bottomley is also capable of decoding an n dimensional TCM code since it is designed to decode multidimensional codes of which an n dimensional TCM code is an example of.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Amca and Bottomley with the teachings of Ghosh by including use of a 4D-TCM code. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of a 4D-TCM code would have provided the opportunity to decode a particular code for which the decoder in Bottomley was designed for.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2133

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (571) 272-3829. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**JOSEPH TORRES
PRIMARY EXAMINER**

Joseph D. Torres, PhD
Primary Examiner
Art Unit 2133